

# THE STATUS OF *POTAMOGETON PERFOLIATUS* (POTAMOGETONACEAE) IN LAKE PONTCHARTRAIN, LOUISIANA

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## ABSTRACT

*Potamogeton perfoliatus* L. is listed as a sensitive plant in the Louisiana Coastal Zone. Four erratic records from Lake Pontchartrain constitute the southwestern extent of its range in North America. To obtain a better understanding of its current status, aquatic habitats near New Orleans were surveyed. It was found in eastern Lake Pontchartrain at three new localities (Point Platte, Big Point, and Irish Bayou) and at two previously reported localities. The Point Platte bed is large (1.8 ha) and in a remote area. The erratic historic distribution of *P. perfoliatus* in Lake Pontchartrain may be due to the establishment of small, scattered, temporary beds in more accessible areas by dispersal from the large Point Platte population. Its restricted Louisiana distribution appears to be due to the suitable sediment and water quality conditions occurring in eastern Lake Pontchartrain.

## RESUMEN

*Potamogeton perfoliatus* L. se incluye entre las plantas amenazadas de la zona litoral de Louisiana. Cuatro citas erráticas a orillas del lago Pontchartrain constituyen la parte suroeste de su área norteamericana. Con objeto de obtener una mejor comprensión de su estado actual se observaron ciertos hábitats acuáticos cercanos a New Orleans. La especie fue hallada en tres nuevas localidades al este del lago Pontchartrain: Pointe Platte, Big Pointe, e Irish Bayou, así como en otras dos localidades previamente citadas. El lecho correspondiente a Point Platte es extenso (1.8 m<sup>2</sup>) y se encuentra en una zona remota. La distribución históricamente errática de *P. perfoliatus* en el lago Pontchartrain puede ser debida al establecimiento de lechos pequeños, dispersos y temporales de zonas más accesibles, debidos a dispersiones que tuvieron lugar a partir de la población de Pointe Platte. Su distribución restringida en Louisiana parece deberse a las condiciones de sedimento apropiado y calidad del agua que se dan en la zona oriental del lago Pontchartrain.

## INTRODUCTION

*Potamogeton perfoliatus* L. (CLASPING PONDWEED) is a vascular plant that occurs in fresh and low salinity estuarine waters. It is currently listed as "extremely rare" in the Louisiana Coastal Zone by the Louisiana National Heritage Program (Lester 1988) with Louisiana records limited to Lake Pontchartrain. It is considered to be a widely distributed north temperate species that in North America occurs primarily on the northeastern coastal



plain (Sculthorpe 1967). Ogden (1943) described its distribution to be Newfoundland to Florida, Ontario, Ohio, and Louisiana, but common only in the northeastern area of its range. Godfrey and Wooten (1979) reported that it occurs in calcareous or brackish ponds and streams with a distribution including Mississippi but not Louisiana. Louisiana records represent the southwestern extent of its range in the United States.

Lake Pontchartrain is a shallow, estuarine embayment in the Mississippi River Deltaic Plain in southeastern Louisiana. It encompasses 1,630 km<sup>2</sup> and has an average depth of 3.7 m and an average salinity of about 4 ppt (Sikora & Kjerfve 1985). Submersed aquatic vegetation (SAV) occurs as discontinuous bands along the northeastern and southeastern shorelines and has been documented to be in decline (Burns et al. 1993; Mayer 1986; Montz 1978; Turner et al. 1980). These SAV bands, which are dominated by *Vallisneria americana*, extend as far as 200 m from shore in some areas, but rarely extend beyond a water depth of 1.5 m (Burns et al. 1993).

Past Louisiana reports did not give a varietal form for *P. perfoliatus*. These records are: Riddell, Tchefuncta River lighthouse, 1883 (Ogden 1943); Brown, Mandeville Beach, 1945 (Haynes 1968); Montz, Pointe aux Herbes, 1973 (Montz 1978); and Brantley and Platt, between Goose Point and Bayou Lacombe, 1990 (Brantley & Platt 1991). Biological surveys of Lake Pontchartrain that included submersed aquatic vegetation were conducted by Chabreck (1972), Lester (1988), Mayer (1986), Perret et al. (1971), Suttikus et al. (1954), and Thompson and Verret (1980). Although *P. perfoliatus* was not reported in these general surveys, it may have been present in the estuary and simply overlooked due to its limited distribution. Attempts to find it prior to its being listed were unsuccessful (Lester 1988).

Based on past records, its occurrence in Lake Pontchartrain is erratic and factors affecting its temporal and spatial distribution are unknown. There is a need for more information regarding the environmental factors affecting the distribution of submersed aquatics in estuaries to better understand why populations have declined worldwide (Dennison et al. 1993). Our study of *P. perfoliatus* was conducted to determine the following: (1) its current distribution in Lake Pontchartrain, (2) whether it occurs in other wetland habitats near Lake Pontchartrain, and (3) its habitat requirements.

#### METHODS

Our study area encompassed the entire shoreline of Lake Pontchartrain, including tidal areas of streams and passes, and aquatic habitats surrounding Lake Pontchartrain (Fig. 1). The study area was bounded by La. Hwy. 36 to the north, Lafitte, La. to the south, La. Hwy 55 to the west and the Pearl River to the east. Field work began in November 1991 and ended in August 1993.



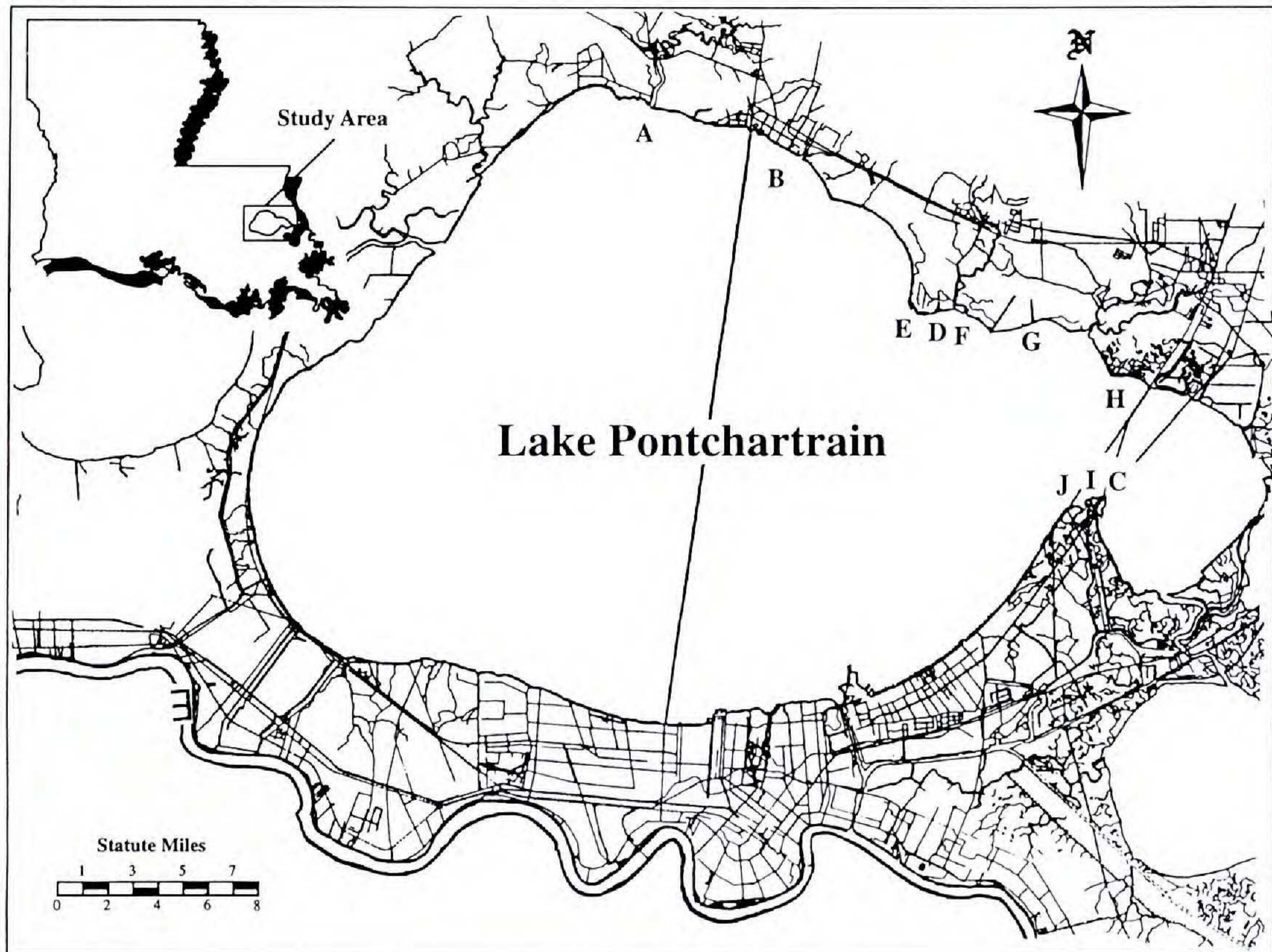


FIG. 1. The historical distribution of *Potamogeton perfoliatus* in the Lake Pontchartrain estuary, LA: Riddell 1838 (A); Brown 1945 (B); Montz 1973 (C); Brantley and Platt 1990 (D); 1991–1993 distribution (Goose Point (E), Bayou Lacombe (F), Pointe Platte (G), Big Point Beach (H), Pointe aux Herbes (I), Irish Bayou (J)). This map is modified from NOAA navigational map no. 11369, 33<sup>rd</sup> Ed.

Species identification followed Godfrey and Wooten (1979); voucher specimens were deposited in the University of New Orleans Herbarium. Areal cover of monotypic stands of *P. perfoliatus* was determined by direct measure. Percent foliar cover in stands containing other species was determined by the line intercept method (Westman 1985).

Secchi disc (20 cm) transparency, water temperature, and water and sediment samples were taken at each site. Salinity was calculated from chloride values determined by the mercuric nitrate method (Harvey 1957; Standard Methods 1989). Sediment textural classes were assigned by grain size analysis (Folk 1980).

#### RESULTS

*Potamogeton perfoliatus* was found at five sites in eastern Lake Pontchartrain (Fig. 1). It occurred in protected shoreline embayments and near the mouths of streams. This plant exhibits a wide range of variation in both morphology and color due to light intensity, sediment type, and water quality differences (Ogden 1943). Specimens from all sites fit the description of *P.*



*perfoliatus* L. var. *bupleuroides* (Fern.) Farw; a smaller plant that fruits freely and is distinguished from *P. perfoliatus* var. *perfoliatus* by a slender stem (diameter = 0.4–1.5 mm), delicate leaf (width = 0.5–2 cm) and few prominent nerves (7–17 nerves, 1–5 prominent) (Godfrey and Wooten 1979; Ogden 1943). Although our specimens fit the description of *P. perfoliatus* L. var. *bupleuroides* (Fern.) Farw, several authors have not recognized this variety (Kartesz 1994; Thomas and Allen 1993).

Southshore beds were present at Pointe aux Herbes (between the La. Hwy 11 bridge and I-10 bridge behind a cement erosion control structure) and the east side of the Pointe aux Herbes peninsula adjacent to the west mouth of Irish Bayou. Three beds occurred on the north shore between Goose Point and the mouth of Bayou Lacombe (500 m east of Goose Point, 200 m west of Bayou Lacombe and 1500 m west of Bayou Lacombe). Other north-shore beds were found near Point Platte (4.0 km east of Bayou Lacombe) and the swimming beach at Big Point. Physicochemical and habitat data from these sites are presented in Table 1.

*Potamogeton perfoliatus* bed size ranged from four plants at Big Point to a 1.8 ha bed at Point Platte. Percent foliar cover of *P. perfoliatus* at Point Platte was 28%; and at Pointe aux Herbes, 72%. Total areal cover of *P. perfoliatus* was 2.2 ha and represents ca. 2.5 % of the total areal cover of all submersed aquatic vegetation in Lake Pontchartrain (Burns et al. 1993). No seasonal differences in bed size were noted, although individual shoot lengths were considerably shorter between December and February. A 20 x 30 m section of the Pointe aux Herbes population was found stripped of its leaves during September 1991. Waterfowl are known to feed upon the leaves, seeds, roots, and rhizomes of *P. perfoliatus* and are most likely responsible for the removal of leaves at this site. All populations occurred at water depths between 31 and 122 cm and were rooted in sand and loamy sand substrates. Secchi disc transparency ranged from 30 to 217 cm, temperature from 17 to 32 °C, and salinity from 1.0 to 8.2 ppt in *P. perfoliatus* beds (Table 1).

#### DISCUSSION

Although the areal cover of submersed aquatic vegetation in Lake Pontchartrain has declined by more than 50% since 1973 (Burns et al. 1993; Mayer 1986; Turner et al. 1980), there may have been an increase in the area occupied by *P. perfoliatus*. Irish Bayou, Big Point, and Pointe Platte are new locality records for *P. perfoliatus*, and it was found at Pointe aux Herbes where it had not been reported since 1973. The largest bed ever reported from Lake Pontchartrain was found at Pointe Platte during our study. The plants found at Big Point on 20 June 1991 disappeared by March 1992 and have not returned. The direct cause for the disappearance



TABLE 1. Habitat data for *Potamogeton perfoliatus* in Lake Pontchartrain, Louisiana.

	Point Platte	Big Point	Irish Bayou	Bayou Lacombe	Pointe aux Herbes
Foliar Stand Size (m <sup>2</sup> )	18000	4 plants	1920,180,300	300,119,150	1014
Flower & Fruit	Present	Absent	Present	Absent	Present
Water Depth (cm)	30.5–91.4	30.5–61.0	30.5–91.4	30.5–61.0	61.0–122.0
Sediment Type	Loamy Sand	Sand	Loamy Sand	Sand	Sand
Species Present	P,V,N,M,E	P,V,R	P,V,R,M	P,V,N,M,E	P,V,R
Shoreline Stability	Er	St	Er	Er	St
Historical Record	a	a	a	b	c
Secchi Disk (cm)	210–217	196–206	31–62	30–72	46–81
Temperature (°C)	28–30	26–28	27–31	17–32	26–32
Salinity (ppt)	4.5	7.0–8.2	1.5–3.7	1.0–4.1	1.7–3.8

P=*Potamogeton perfoliatus*; V=*Vallisneria americana*; R=*Ruppia maritima*; M=*Myriophyllum spicatum*; N=*Najas guadalupensis*; E=*Eleocharis parvula*; St=stable shoreline; Er=eroding shoreline; a=first record for this area; b=first record 1990 (Brantly & Platt 1991); c=first record 1973 (Montz 1978).

of *P. perfoliatus* in this area is not known. However, increased wave energy, associated with cement bulkheads along the shoreline, and “eatouts” by waterfowl may be responsible. The relative frequent occurrence and disappearance of scattered *P. perfoliatus* populations suggests that small populations may persist by occasional recolonization rather than regulation of population size.

Beds of *P. perfoliatus* greater than 300 m<sup>2</sup> in size had plants that flowered and produced fruit during March and April. The 1.8 ha bed found at Point Platte might be the source of small temporary beds located elsewhere in the estuary. These beds, which may become extirpated during adverse conditions, could become established through the dispersal of seeds and vegetative propagules from the large Pointe Platte bed by waterfowl and currents. Because *P. perfoliatus* occurs in sand and loamy sand sediments, it is restricted to the sites in northern and southeastern Lake Pontchartrain where these sediments occur. The large Point Platte bed may be important in maintaining the disjunct Lake Pontchartrain populations.

*Potamogeton perfoliatus* is an inland species found in alkaline or brackish ponds and streams (Godfrey and Wooten 1979); it can also tolerate low-salinity estuarine conditions (Den Hartog 1981). It is present in many Atlantic Coast estuaries including the upper Chesapeake Bay (Orth et al. 1992) and can tolerate salinities up to 12 ppt (Twilley and Barko 1990). The stable, low salinity of Lake Pontchartrain (Sikora and Kjerfve 1985) is within the range of water quality conditions reported by other investigators and is suitable for *P. perfoliatus* growth.

The absence of *P. perfoliatus* from other sites in the study area is probably due to water quality and bottom sediment type. Eastern Lake Pontchartrain



is the only site in the study area that has low-salinity water and sand sediment combined. Aquatic habitats north of Lake Pontchartrain have sand sediment but unsuitable acidic water low in dissolved solids. Other habitats south of Lake Pontchartrain with alkaline or brackish water have unsuitable silt and clay sediments. Herbivory and competition from other aquatic plants probably also affect its abundance and distribution. *Potamogeton perfoliatus* is an excellent food source for waterfowl; redheads, canvasback, mallard, ring-necked duck, black duck, Canada geese and tundra swans are known to feed on the seeds, leaves, stems and rhizomes (Hurley 1990). Waterfowl are probably responsible for the removal of leaves from *P. perfoliatus* at Pointe aux Herbes and the disappearance of all *P. perfoliatus* from Big Point during our study. Competition with other established aquatic plants, particularly in nutrient-rich floodplain habitats, may also limit its distribution.

#### ACKNOWLEDGMENTS

This research was partially funded by the UNO Urban Waste Management and Research Center and a kind gentleman who would like to remain anonymous.

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